USDA Natural Resources Conservation Service

Ecological site R236XY174AK
Subarctic Mosaic Loamy Steep Bluffs

Last updated: 2/13/2024
Accessed: 04/28/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 236X–Bristol Bay-Northern Alaska Peninsula Lowlands

The Bristol Bay-Northern Alaska Peninsula Lowland Major Land Resource Area (MLRA 236) is located in Western Alaska. This MLRA covers approximately 19,500 square miles and is defined by an expanse of nearly level to rolling lowlands, uplands and low to moderate hills bordered by long, mountain footslopes. Major rivers include the Egegik, Mulchatna, Naknek, Nushagak, and Wood River. MLRA 236 is in the zone of discontinuous permafrost. It is primarily in areas with finer textured soils on terraces, rolling uplands and footslopes. This MLRA was glaciated during the early to middle Pleistocene. Moraine and glaciofluvial deposits cover around sixty percent of the MLRA. Alluvium and coastal deposits make up a large portion of the remaining area (Kautz et al., 2012; USDA, 2006).

Climate patterns across this MLRA shift as one moves away from the coast. A maritime climate is prominent along the coast, while continental weather, commonly associated with Interior Alaska, is more influential inland. Across the MLRA, summers are general short and warm while winters are long and cold. Mean annual precipitation is 13 to 50 inches, with increased precipitation at higher elevations and areas away from the coast. Mean annual temperatures is between 30 and 36 degrees F (USDA, 2006).

The Bristol Bay-Northern Alaska Peninsula MLRA is principally undeveloped wilderness. Federally managed land includes parts of the Katmai and Aniakchak National Parks, and the Alaska Peninsula, Becharof, Togiak and Alaska Maritime National Wildlife Refuges. The MLRA is sparsely populated. Principal communities include Dillingham, Naknek, and King Salmon. Commercial fishing in Bristol Bay and the Bering Sea comprises a major part of economic activity in the MLRA. Other land uses include subsistence activities (fishing, hunting, and gathering) and sport hunting and fishing (USDA, 2006).

Classification relationships

Alaska Vegetation Classification:
Open tall scrubland (II.B.2 - level III) / Open willow scrubland (II.B.2.a - level IV)
(Viereck et al., 1992)

Ecological site concept

This ecological site is on linear bluffs of drainageways and narrow river valleys. Site elevation is between 170 and 550 feet above sea level. Slope gradients are strong to very steep (11 – 85 percent). Soil hydrology, low soil acidity, and a fire regime shape the vegetation on this site. Slope gradient and related erosion, along with a year-round water table, shape the vegetative community on this site. Aquic conditions restrict vegetation to facultative to obligate wet wetland species. Acidic conditions, common to the Spodosols found here, have a relatively low natural fertility, further restricting vegetation

The reference state supports two communities. The reference plant community is characterized as an open willow scrubland (Viereck et al., 1992). It is composed of one or more willow species with understory and open areas host

to dense low scrub, forbs, and graminoids. Post-fire vegetation is typically comprised of fast growing herbaceous species with wind dispersed seeds and nitrogen-fixing shrub species such as alder.

Associated sites

R236XY154AK	**Subarctic Ericaceous Scrub Loamy Plain Swales** R236XY154AK describes concave swale features that are sometimes present between bluffs. Wetter soil and ponding disturbances in the swale support a unique representative plant community not found in R236XY174AK.
R236XY132AK	**Subarctic Dwarf Scrub Dry Loamy Slopes** R236XY132AK describes shoulder positions above bluffs. These exposed, convex shoulders support a distinct dwarf shrub community.

Similar sites

R236XY175AK	**Subarctic Scrub Loamy Steep Coastal Bluffs** Both sites describe steep bluff landforms. R236XY175AK describes coastal escarpments subject to coastal erosion, while R236XY174AK is found above rivers and drainageways. Differences in erosion and soil hydrology support unique ecological sites on these landforms.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Vaccinium uliginosum* (2) *Empetrum nigrum*
Herbaceous	(1) *Chamerion angustifolium* (2) *Calamagrostis canadensis*

Physiographic features

This site is on linear bluff sideslopes. Elevation generally ranges from 170 to 550 feet above sea level. Slope gradients are usually strong to very steep (11 – 85 percent). This site is found at all aspects. Slope gradient and related erosion as well as a year-round water table shape the vegetative community on this site.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear
Geomorphic position, hills	(1) Side Slope
Hillslope profile	(1) Backslope
Landforms	(1) Upland > Bluff
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	170–550 ft
Slope	11–85%
Water table depth	39–59 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Medium to high
Flooding frequency	None

Ponding frequency	None
Elevation	0–800 ft
Slope	10–85%
Water table depth	39–59 in

Climatic features

The climate of this site reflects that of the MLRA, which is described as maritime polar (EPA, 2013). Temperatures are moderated by the nearby Bristol Bay and norther Pacific bodies of water. Annual precipitation ranges from 21 – 34 inches with approximately 40 percent occurring during the June-September growing season (PRISM, 2018).

Table 4. Representative climatic features

Frost-free period (characteristic range)	75-100 days
Freeze-free period (characteristic range)	65-90 days
Precipitation total (characteristic range)	21-34 in
Frost-free period (actual range)	75-100 days
Freeze-free period (actual range)	65-90 days
Precipitation total (actual range)	15-41 in
Frost-free period (average)	90 days
Freeze-free period (average)	75 days
Precipitation total (average)	29 in

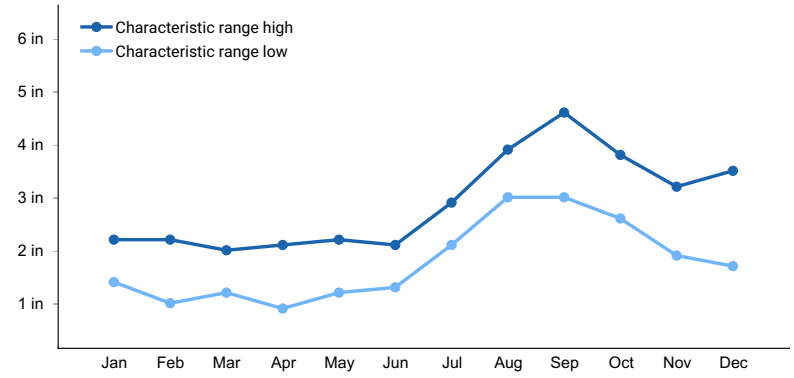


Figure 1. Monthly precipitation range

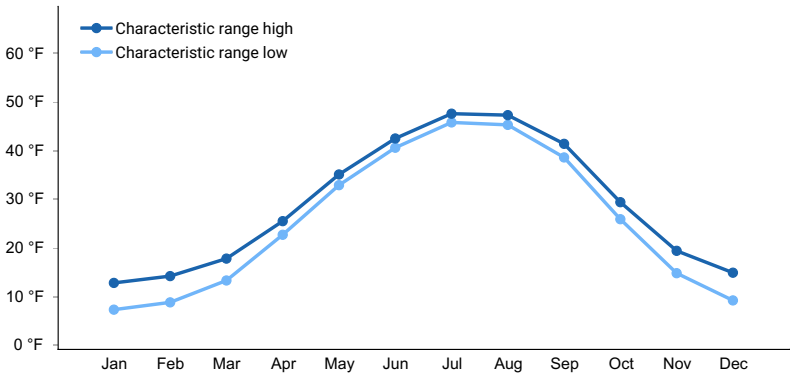


Figure 2. Monthly minimum temperature range

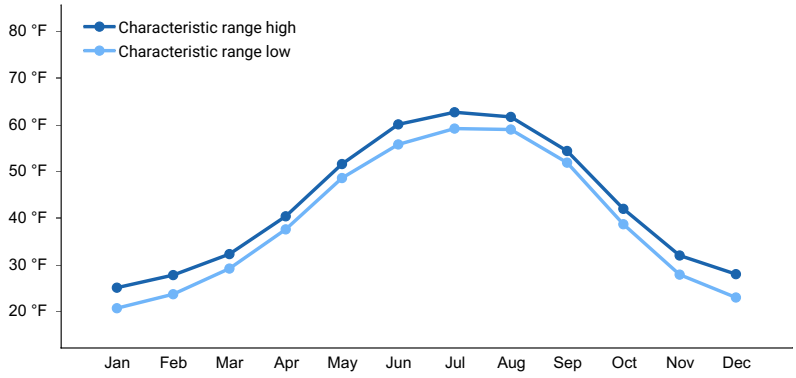


Figure 3. Monthly maximum temperature range

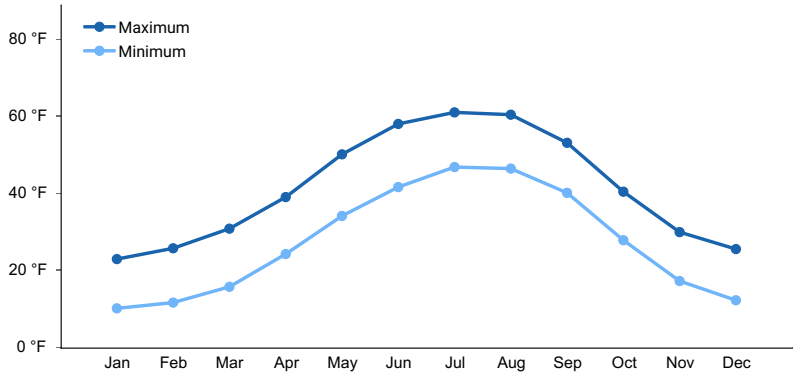


Figure 4. Monthly average minimum and maximum temperature

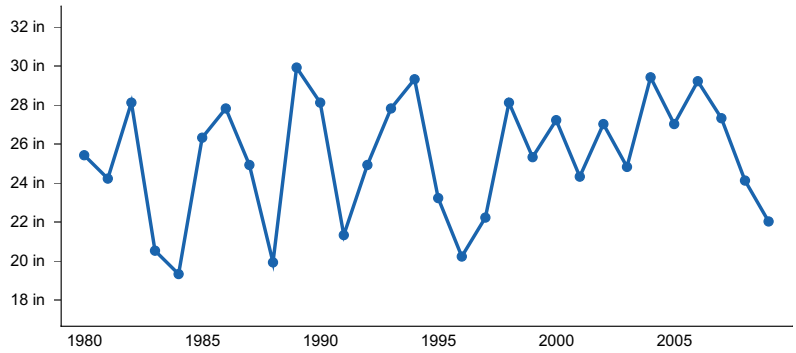


Figure 5. Annual precipitation pattern

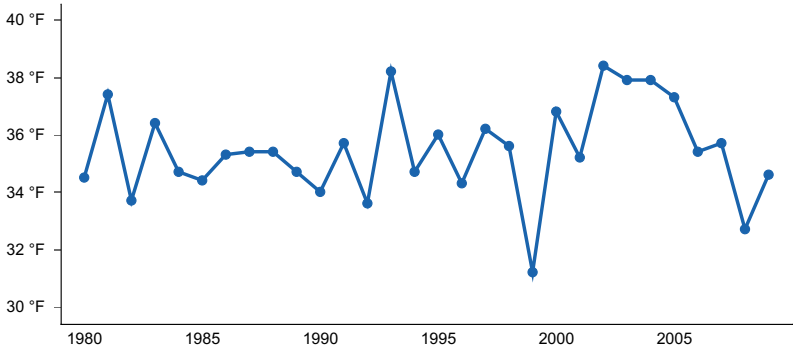


Figure 6. Annual average temperature pattern

Influencing water features

Due to its landscape position and slope, this site is not influenced by wetland or riparian water features. Precipitation and run-on are the main sources of water.

Soil features

Soils are acidic Spodosols (Soil Survey Staff, 2013). Soils are very deep and moderately well drained. They support a cryic temperature regime and an udic moisture regime. Parent material is mossy organic material over slope alluvium over gravelly drift.

Soil characteristics that influence vegetation include soil hydrology, decreased natural fertility levels, and cryoturbation. Moderately deep redoximorphic concentrations and aquic conditions between 41 and 72 inches suggest wet soils conditions that restrict vegetation to facultative to obligate wet wetland species. Acidic conditions, common to Spodosols, have a relatively low natural fertility, further restricting vegetation (Soil Survey Staff, 2013). Though permafrost is absent, soils undergo cryoturbation, which may restrict deep rooting species from establishing on this site.

Correlated soil components in MLRA 236:
D36-Western maritime scrub loamy colluvial slopes
Typic Dystrocryepts

Table 5. Representative soil features

Parent material	(1) Alluvium (2) Drift
Surface texture	(1) Highly organic silt loam
Drainage class	Moderately well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	2.1–2.6 in
Soil reaction (1:1 water) (0-10in)	3.2–5.9
Subsurface fragment volume <=3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0%

Table 6. Representative soil features (actual values)

Drainage class	Moderately well drained to well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	1.8–2.6 in
Soil reaction (1:1 water) (0-10in)	3.2–5.9
Subsurface fragment volume <=3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site is on bluffs of drainageways and narrow rivers. Local site factors including soil characteristics and a fire disturbance support two unique plant communities. The reference plant community is an open willow scrubland with various low shrubs, forbs and graminoids throughout. Steeper slopes of this site may support more ericaceous shrubs and less willow.

Wet soil conditions during the growing season shape the reference plant community. A moderately deep water table is present year round. Redoximorphic features suggest that anaerobic conditions exist at shallower depths for part of the year. These conditions favor facultative to obligate wet wetland species.

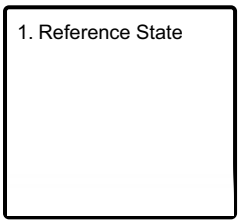
A fire disturbance creates one recognized post-fire community. The species of the reference plant community are fire-resilient. It is suspected that a severe fire that burns the organic soil layer and below-ground biomass is required to create community 1.2.

This site supports slight to moderate browse of willow by moose. This does not appear to affect the ecological processes of the site.

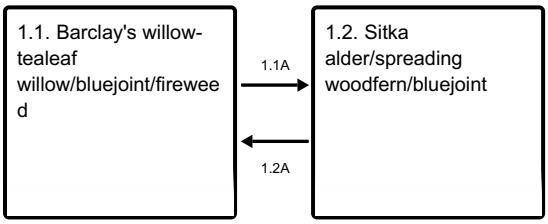
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - Fire

1.2A - Fire recovery

State 1
Reference State

The reference state supports two community phases, which are distinguished by the developed structure and dominance of the vegetation and by their ecological function and stability. The reference community phase is scrubland. This report provides baseline inventory data for the vegetation in this ecological site. Future data collection is needed to provide further information about existing plant communities and the disturbance regime that results in transitions from one community to another. Common and scientific names are from the USDA PLANTS database. Community phases are characterized by the Alaska Vegetation Classification System (Viereck et al., 1992).

Community 1.1
Barclay's willow-tealeaf willow/bluejoint/fireweed

Figure 7. Typcial area of the reference plant community.

Community Phase 1.1 Canopy Cover Table

Vegetation data is aggregated across modal sample plots for this community phase and is provided as frequency (percent) and mean canopy cover (percent) of the most dominant and ecologically relevant species. Canopy cover is represented as a mean with the range in parentheses.

Plant group	Common name	Scientific name	USDA plant code	Frequency (percent)	Mean canopy cover (percent)
S	Lapland cornel	*Cornus suecica*	COSU4	100	15
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	100	1
S	Barclay's willow	*Salix barclayi*	SABA3	60	40
S	Tealeaf willow	*Salix pulchra*	SAPU15	60	40
S	Sitka alder	*Alnus viridis* ssp. *sinuata*	ALVIS	60	10
G	Bluejoint	*Calamagrostis canadensis*	CACA4	60	15
F	Fireweed	*Chamerion angustifolium*	CHAN9	100	6
F	Woolly geranium	*Geranium erianthum*	GEER2	100	2

The sample plots are distributed across the survey area and are independent of one another.

Plant functional group classifications—T = trees, S = shrubs, G = graminoids, F = forbs, B = bryophytes, L = lichens

Canopy cover data is rounded, except trace (0.1 percent) cover. Data ranging from 1 to 9 percent cover is rounded to the nearest integer. Data ranging from 10 to 100 percent cover is rounded to the nearest factor of 5.

Figure 8. Frequency and canopy cover of plants in community 1.1.

Figure 9. More ericaceous shrubs typically are in the drier areas of escarpments.

The reference plant community is open low scrubland (Viereck et al., 1992). It consists of patchy tealeaf willow (*Salix pulchra*) and Barclay's willow (*S. barclayi*) and other shrubs, including Lapland cornel (*Cornus suecica*), bog blueberry (*Vaccinium uliginosum*), and marsh Labrador tea (*Ledum palustre* ssp. decumbens). Bluejoint (*Calamagrostis canadensis*) and various forbs such as fireweed (*Chamerion angustifolium*), woolly geranium (*Geranium erianthum*), and spreading woodfern (*Dryopteris expansa*) also are present. Other species may include black crowberry (*Empetrum nigrum*), lingonberry (*Vaccinium vitis-idaea*), arctic raspberry (*Rubus arcticus*), Altai fescue (*Festuca altaica*), and field horsetail (*Equisetum arvense*). The ground cover includes mosses, lichens, herbaceous litter, and woody litter. Some areas are bare soil.

Dominant plant species

- Lapland cornel (*Cornus suecica*), shrub

- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- Barclay's willow (*Salix barclayi*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous
- woolly geranium (*Geranium erianthum*), other herbaceous

Community 1.2
Sitka alder/spreading woodfern/bluejoint

Figure 10. Typical area of community 1.2.

Community Phase 1.2 Canopy Cover Table

Vegetation data is aggregated across modal sample plots for this community phase and is provided as frequency (percent) and mean canopy cover (percent) of the most dominant and ecologically relevant species. Canopy cover is represented as a mean with the range in parentheses.

Plant group	Common name	Scientific name	USDA plant code	Frequency (percent)	Mean canopy cover (percent)
S	Sitka alder	*Alnus viridis* ssp. *sinuata*	ALVIS	100	90
G	Bluejoint grass	*Calamagrostis canadensis*	CACA4	100	15
F	Spreading woodfern	*Dryopteris expansa*	DREX2	100	50

This dataset includes data from 1 sample plots. The sample plots are distributed across the survey area and are independent of one another. Due to the limited data available for this community phase, personal field observations were also used to aid in describing the vegetative community.

Plant functional group classifications—T = trees, S = shrubs, G = graminoids, F = forbs, B = bryophytes, L = lichens

Canopy cover data is rounded, except trace (0.1 percent) cover. Data ranging from 1 to 9 percent cover is rounded to the nearest integer. Data ranging from 10 to 100 percent cover is rounded to the nearest factor of 5.

Figure 11. Frequency and canopy cover of plants in community 1.2.

The post-fire community is closed tall scrubland (Viereck et al., 1992). The community consists of an overstory of dense Sitka alder (*Alnus viridis* ssp. sinuata) and an understory of bluejoint and spreading woodfern. Other species may include spirea (*Spiraea stevenii*), horsetails, and arctic starflower (*Trientalis europaea*). The ground cover include mosses and herbaceous litter.

Dominant plant species

- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- spreading woodfern (*Dryopteris expansa*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

Barclay's willow-tealeaf willow/bluejoint/fireweed

Sitka alder/spreading woodfern/bluejoint

The reference plant community is likely resilient to moderate to low-severity fires. The willow species that comprise this community are fire-adapted (Uchytil, 1991). Other shrub species typically grow back from undamaged root stocks, while fast growing forbs and graminoids resprout post-fire. High severity fires destroy below-ground biomass and remove the top organic soil layer. These areas are susceptible to erosion. Post-fire vegetation is typically comprised of fast growing herbaceous species with wind-dispersed seeds and nitrogen-fixing shrub species such as alder.

Pathway 1.2A
Community 1.2 to 1.1

Sitka alder/spreading woodfern/bluejoint

Barclay's willow-tealeaf willow/bluejoint/fireweed

As soils develop and soil moisture levels increase, the post-fire community is replaced by hydrophytic vegetation. This transition is not well understood and further data are needed.

Additional community tables

Inventory data references

Modal points for Community 1.1
07AO01102
10SS13002
10TD12205

Modal points for community 1.2
10TD13502

References

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Approval

Kirt Walstad, 2/13/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	04/28/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**